

(19)

Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 237 252 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
06.11.2002 Bulletin 2002/45

(51) Int Cl.7: H02K 1/17, H02K 1/27,
H02K 23/04

(43) Date of publication A2:
04.09.2002 Bulletin 2002/36

(21) Application number: 02251261.0

(22) Date of filing: 25.02.2002

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**

Designated Extension States:
AL LT LV MK RO SI

(30) Priority: 23.02.2001 US 271141 P
22.02.2002 US

(71) Applicant: Black & Decker Inc.
Newark Delaware 19711 (US)

(72) Inventors:

- Agnes, Michael
MD 21014 (US)
- Ortt, Earl
MD 21014 (US)

- Wang, Ren H.
MD 21093 (US)
- Boyce, Allyn
MD 21013 (US)
- Verbrugge, Brandon
MD 21288 (US)
- Zhang, Jiaqi
MD 21030 (US)
- Du, Hung T.
MD 21136 (US)
- Walter, Richard T.
MD 21013 (US)

(74) Representative: Bell, Ian Stephen et al
Black & Decker UK
210 Bath Road
Slough, Berkshire SL1 3YD (GB)

(54) Magnet assembly for a motor and method of making same

(57) A cylinder/magnet assembly for a field of an electric machine, such as a stator of a brush type motor or a rotor of a brushless motor, alternator or generator, is formed by inserting pre-formed magnets on a cylinder having anchors. Plastic is molded around the magnets and anchors to secure the magnets to a surface of the cylinder. In another aspect of the invention, magnets are inserted into magnet pockets of an assembly ring. The assembly ring is inserted into a cylinder and plastic molded around the assembly ring and magnets to secure the assembly ring and magnets to the cylinder. In another aspect of the invention, magnets are inserted in a first assembly ring which is then inserted in one side of a cylinder. A second assembly ring is inserted into the other side of the cylinder and mated to the first assembly ring. Plastic is molded around the assembly rings and magnets to secure them to the cylinder. In another as-

pect of the invention, magnets are inserted into magnet receiving pockets of a cylinder and plastic molded there-around. In another aspect of the invention, the north and south poles of a cylinder and magnet assembly have unequal distribution angles. In another aspect of the invention, the north and south poles a cylinder and magnet assembly have unequal numbers of magnets. In another aspect of the invention, the anchors are also formed as flux spreaders. In another aspect of the invention, flux spreaders are disposed on inner surfaces of the magnets of each pole of a cylinder and magnet assembly. In another aspect of the invention, the foregoing aspects are used in a stator of a motor. In another aspect of the invention, such a stator is used in a power tool.

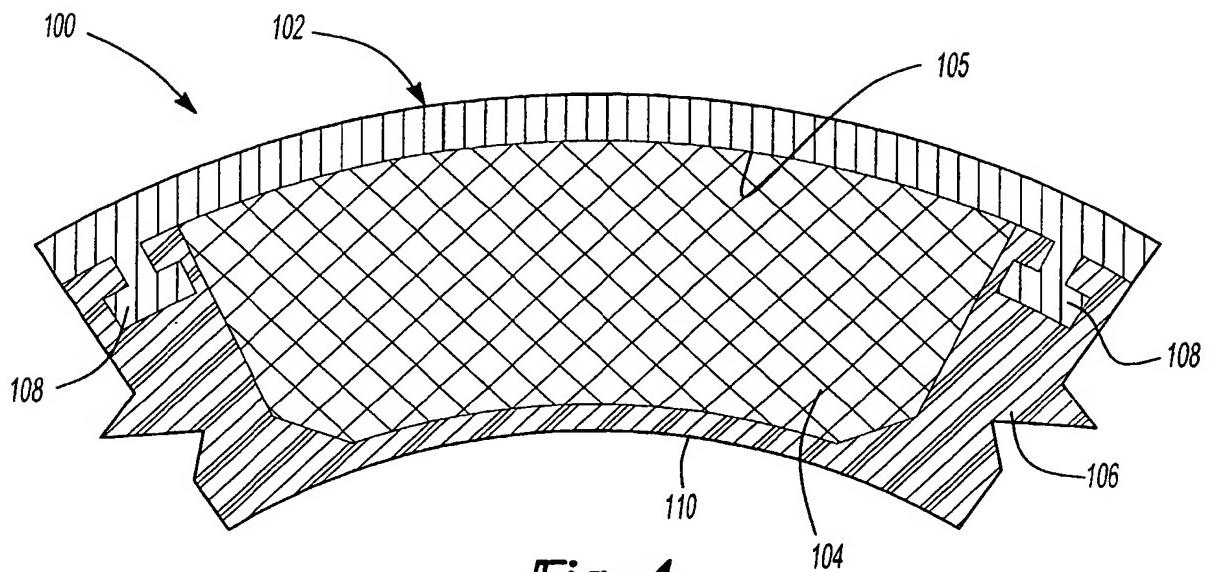


Fig-4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 25 1261

| DOCUMENTS CONSIDERED TO BE RELEVANT | | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.7) |
|-------------------------------------|---|--------------------------|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | | |
| X | FR 2 617 344 A (VALEO) 30 December 1988 (1988-12-30) * page 2, line 18 - line 22 * * page 3, line 26 - page 4, line 17; figure 1 * | 1-35, 72, 73 | H02K1/17 H02K1/27 H02K23/04 |
| X | US 4 973 872 A (DOHOGNE L RANNEY) 27 November 1990 (1990-11-27) * column 3, line 4 - column 5, line 17; figure 3 * | 1-31, 72, 73 | |
| X | US 4 625 392 A (STOKES VIJAY K) 2 December 1986 (1986-12-02) * column 3, line 37 - column 4, line 37; figures * | 1-31, 54-66, 72-75 | |
| X | US 4 877 986 A (SHIMIZU YUZURU) 31 October 1989 (1989-10-31) * column 2, line 61 - column 4, line 40; figures * | 1-35, 54-66, 72-75 | TECHNICAL FIELDS SEARCHED (Int.Cl.7) |
| X | US 4 954 736 A (KAWAMOTO TETSUO ET AL) 4 September 1990 (1990-09-04) * column 3, line 36 - column 4, line 37 * * column 6, line 19 - line 23; figure 2 * | 1-35, 54-66, 72-75 | H02K |
| X | US 3 887 826 A (APOSTOLERIS THEODORE G) 3 June 1975 (1975-06-03) * column 3, line 1 - line 67; figure 1 * | 1-31, 54-66, 72-75 | |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|--|----------------------------------|-------------------|
| MUNICH | 7 June 2002 | Mayer-Martin, E-M |
| CATEGORY OF CITED DOCUMENTS | | |
| X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document | | |
| I : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons B : member of the same patent family, corresponding document | | |

1500 03 02 (P24501)



European Patent
Office

Application Number

EP 02 25 1261

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

- No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

- None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-35, 54-66, 72-75

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 25 1261

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

07-06-2002

| Patent document cited in search report | | Publication date | | Patent family member(s) | Publication date |
|--|---|------------------|------|-------------------------|------------------|
| FR 2617344 | A | 30-12-1988 | FR | 2617344 A1 | 30-12-1988 |
| US 4973872 | A | 27-11-1990 | US | 4910861 A | 27-03-1990 |
| US 4625392 | A | 02-12-1986 | NONE | | |
| US 4877986 | A | 31-10-1989 | JP | 1953293 C | 28-07-1995 |
| | | | JP | 6081437 B | 12-10-1994 |
| | | | JP | 63287348 A | 24-11-1988 |
| US 4954736 | A | 04-09-1990 | DE | 3913618 A1 | 02-11-1989 |
| | | | GB | 2217924 A ,B | 01-11-1989 |
| | | | JP | 2084032 A | 26-03-1990 |
| | | | KR | 9200499 B1 | 14-01-1992 |
| US 3887826 | A | 03-06-1975 | CA | 1022223 A1 | 06-12-1977 |